

INFORMATION ITEM

Follow-up information from the Department of Military Affairs Install Solar Panels at Armories Statewide project

During the June 23, 2021 Capital Planning Advisory Board meeting, a question was raised as to the energy savings associated with the Install Solar Panels at Armories Statewide project (\$2,000,000 RF/FF). The Department of Military Affairs has provided the attached report - Kentucky Air National Guard Electric Cost Report, which denotes overall energy savings of about \$1.95 million since 2014. Additional information regarding the agency's ongoing energy initiatives is also provided.

BOARD ACTION: Information only. No action is required.

Since 2014 the KYARNG (Kentucky Army National Guard) has installed over 3 Megawatts of solar arrays on its installations resulting in a savings of nearly \$1.95 Million Dollars from electric produced through these arrays. The table below shows electric data from Federal Fiscal Year 2010 thru Federal Fiscal Year 2020. Utilizing Solar Arrays along with other Energy Conservation Measures the KYARNG has been able to reduce its purchased electric by 33% and maintain nearly the same annual cost for purchased electric around \$1.7 million dollars all while the blended rate of the cost to purchase electricity has gone up nearly 40%. The KYARNG has also increased its footprint across the Commonwealth over 600,000 Square feet over the last decade.

Federal Fiscal Year	Building Square Footage	Total Utility Electric Usage (kWh)	Annual Electric Cost (\$)	Blended Rate Electric \$/kWh	EUI (MMBtu/KSF)	Total Solar Production (kWh)	Annual Electric Savings from Solar (\$)	Cumulative Electric \$ Savings from Solar
2011	2,233,837	20,908,145	\$1,786,734	\$0.0855	58.81			
2012	2,358,540	19,668,798	\$1,708,506	\$0.0869	47.74			
2013	2,371,600	20,433,234	\$1,780,099	\$0.0871	52.13			
2014	2,446,362	20,531,707	\$1,907,960	\$0.0929	52.65	824,899	\$76,656	\$76,656
2015	2,482,557	19,194,164	\$1,832,141	\$0.0955	47.69	1,376,067	\$131,350	\$208,006
2016	2,417,299	17,140,149	\$1,781,250	\$0.1039	40.15	2,407,260	\$250,169	\$458,174
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2020	2,908,991	13,852,088	\$1,656,780	\$0.1196	27.49	3,417,806	\$408,787	\$1,949,997

Table 1: Annual Electric Data

KYARNG Electric Cost Report

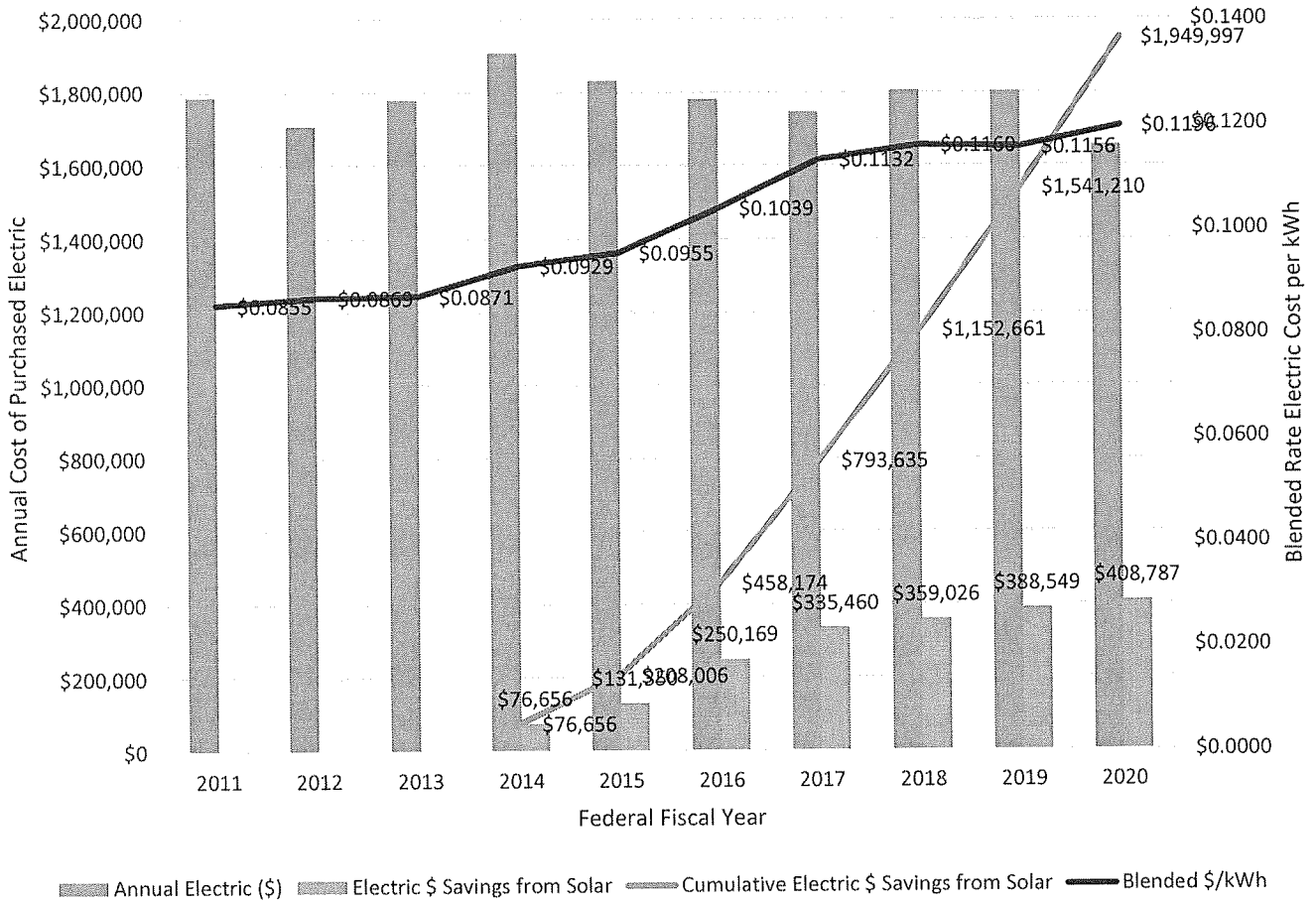


Figure 1: KYARNG Electric Cost Graph

KYARNG Electric Usage Report

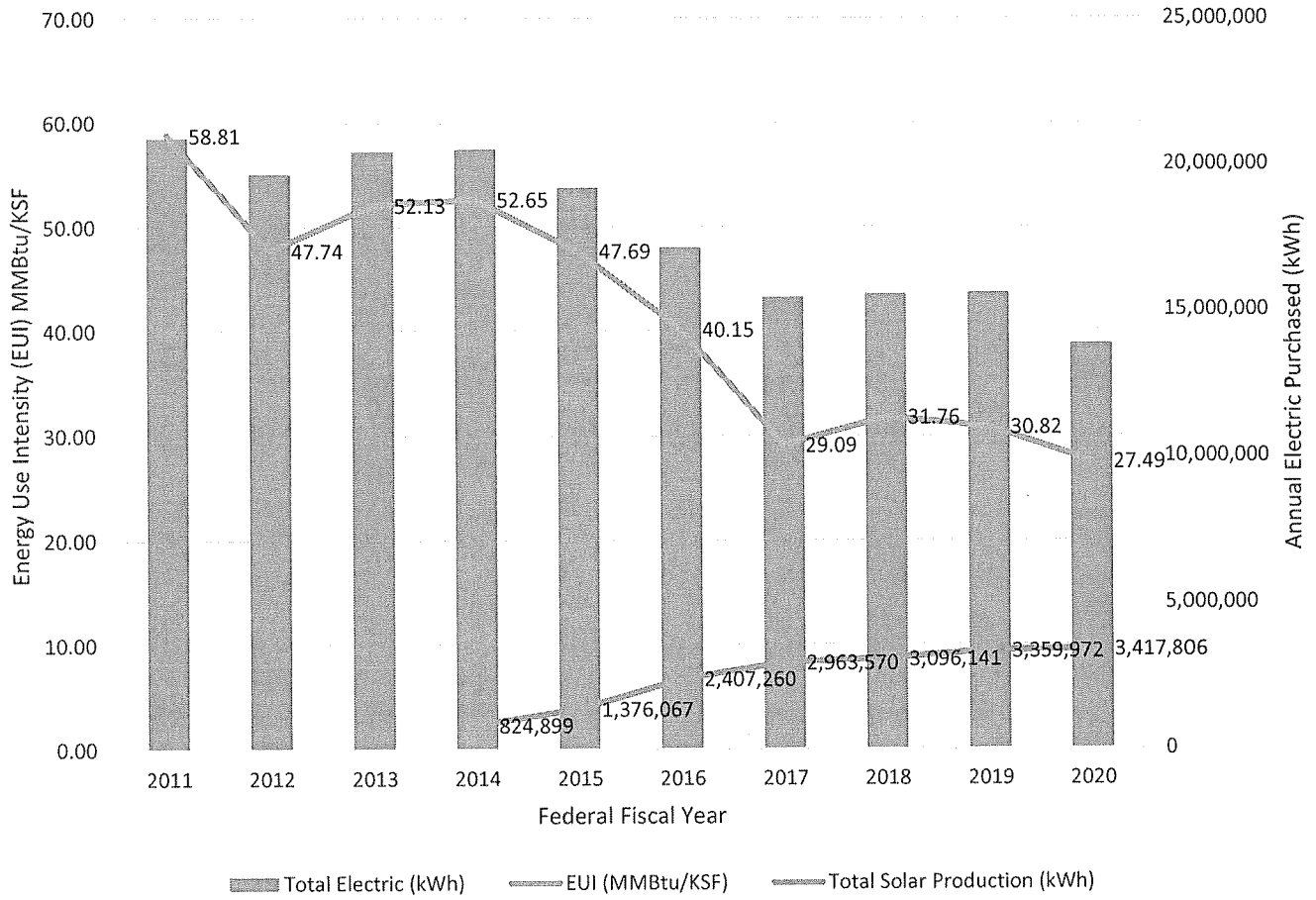


Figure 2: KYARNG Electric Use Graph

KYARNG Cumulative KW Photovoltaic Installed

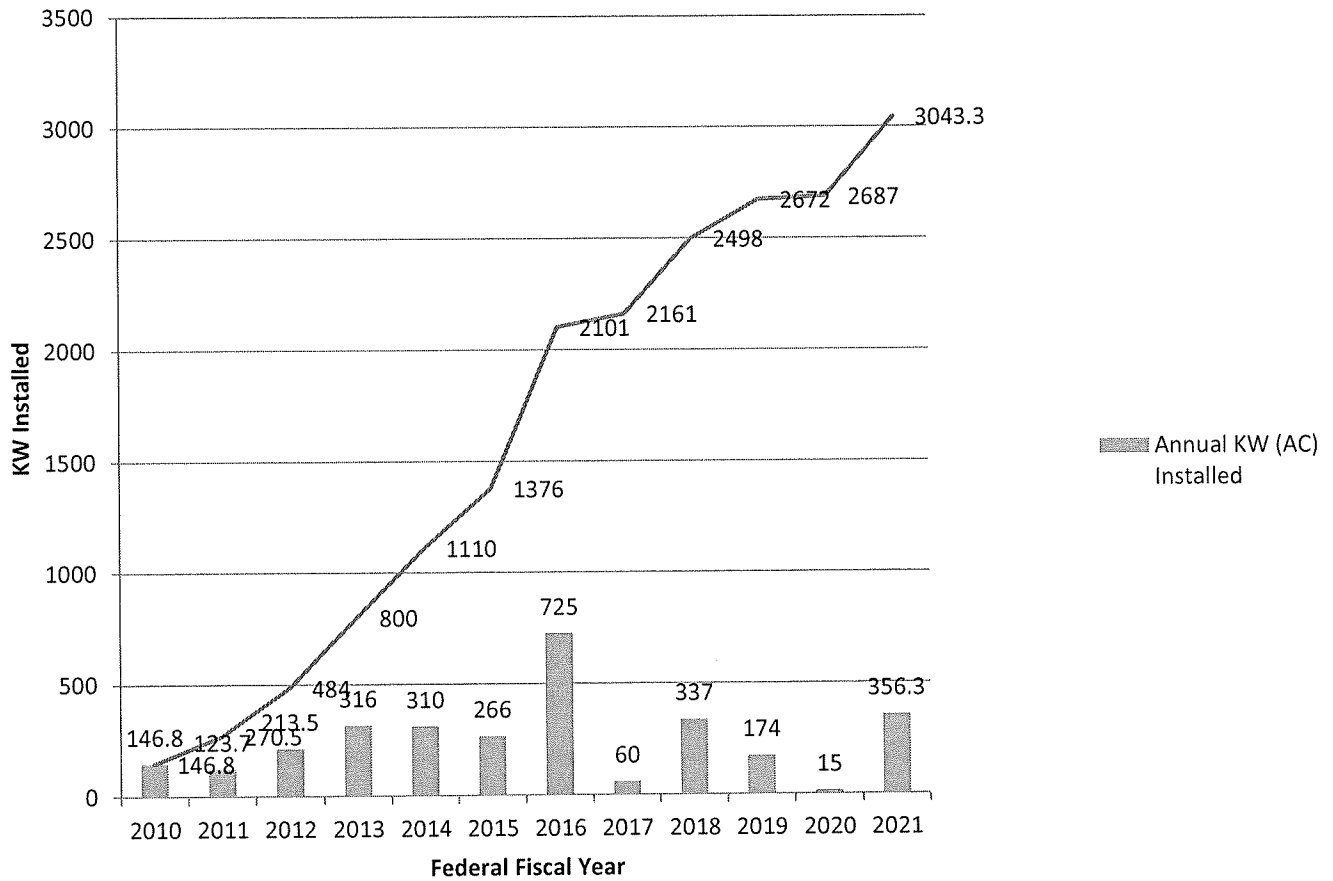


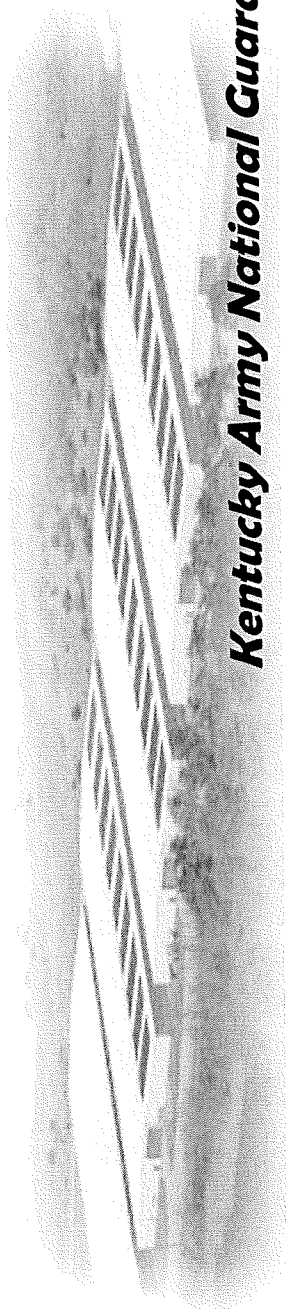
Figure 3: Solar Installation Graph

Federal Fiscal Year	CUMULATIVE Total KW (AC)	HLDTs	WHFRTC	MATES	BNGC	FMS	Armory & RC	Total KW (AC) Installed Annually
2010	146.8	77	69.8					146.8
2011	270.5	97	26.7					123.7
2012	484		171.5	42				213.5
2013	800		254.4		34	27.6		316
2014	1110		0		112		198	310
2015	1376		266					266
2016	2101		70		42		613	725
2017	2161						60	60
2018	2498	15				124	198	337
2019	2672						174	174
2020	2687	15						15
2021	3043.3				248	75	33.3	356.3

Table 2: Solar Installation Data

Steps to Sustainability

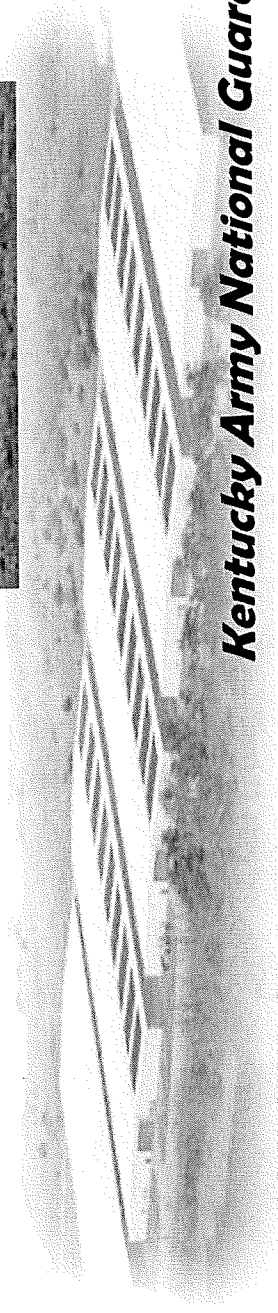
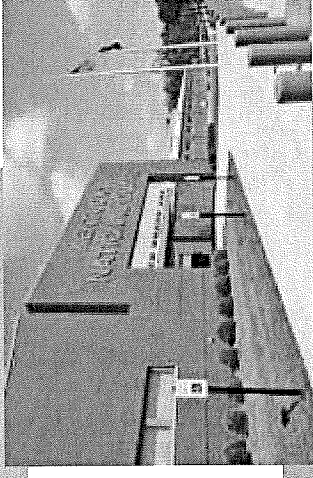
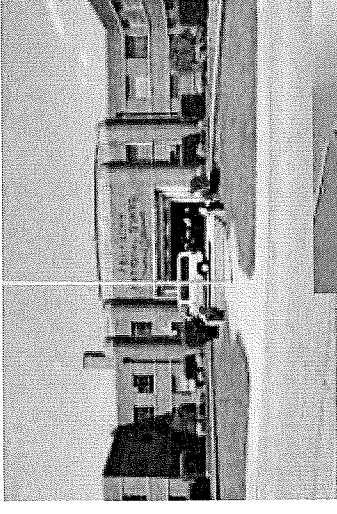
Kentucky Army National Guard's
and Department of Military Affairs
Energy Initiatives



Kentucky Army National Guard

From Ashland to Paducah...

- 2,908,991 sqft. of building space
- 12,642 acres of training land
- 55 Armories & Readiness Centers
- 11 Field Maintenance Shops
- 4 Regional Maintenance Shops
- 3 Training Sites
 - Wendell H. Ford Regional Training Center
 - Harold L. Disney Training Site (Artemus)
 - Eastern Kentucky Training Site (Hidden Valley)



Kentucky Army National Guard

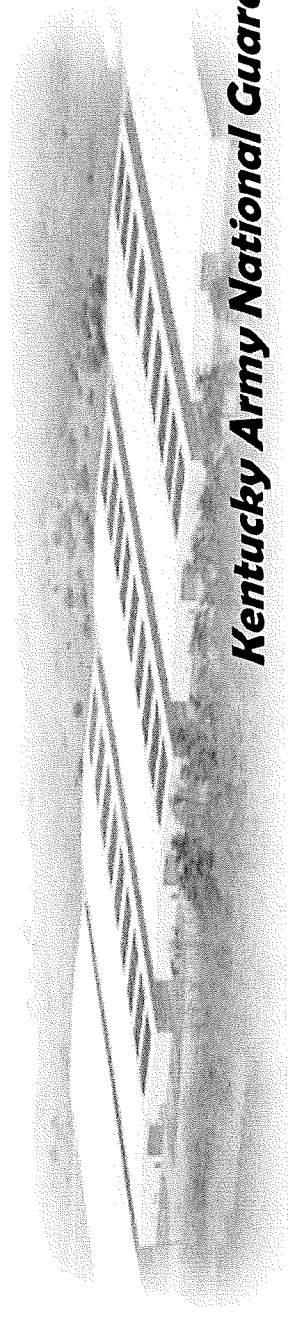
KYARNG's / DMA Vision for Sustainability

The Kentucky Army National Guard will efficiently balance requirements and resources, effectively supporting all current and future missions. It will be a national leader in sustainable innovation driven by informed and empowered Soldiers and Civilians.

KYARNG's / DMA Mission in Sustainability

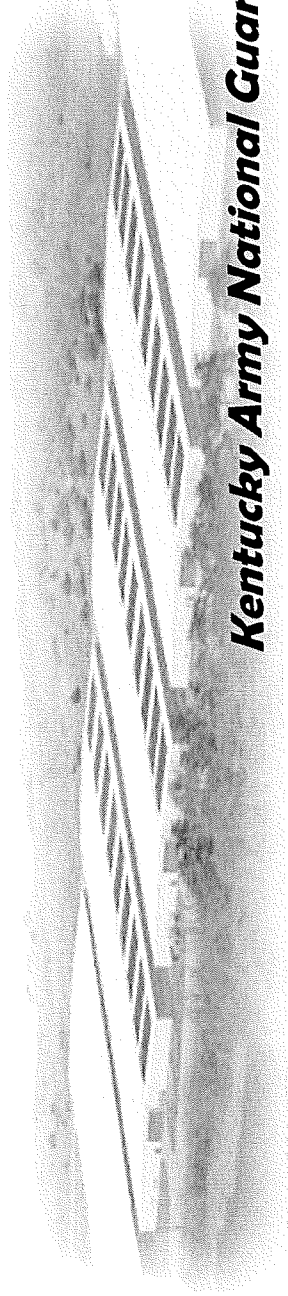
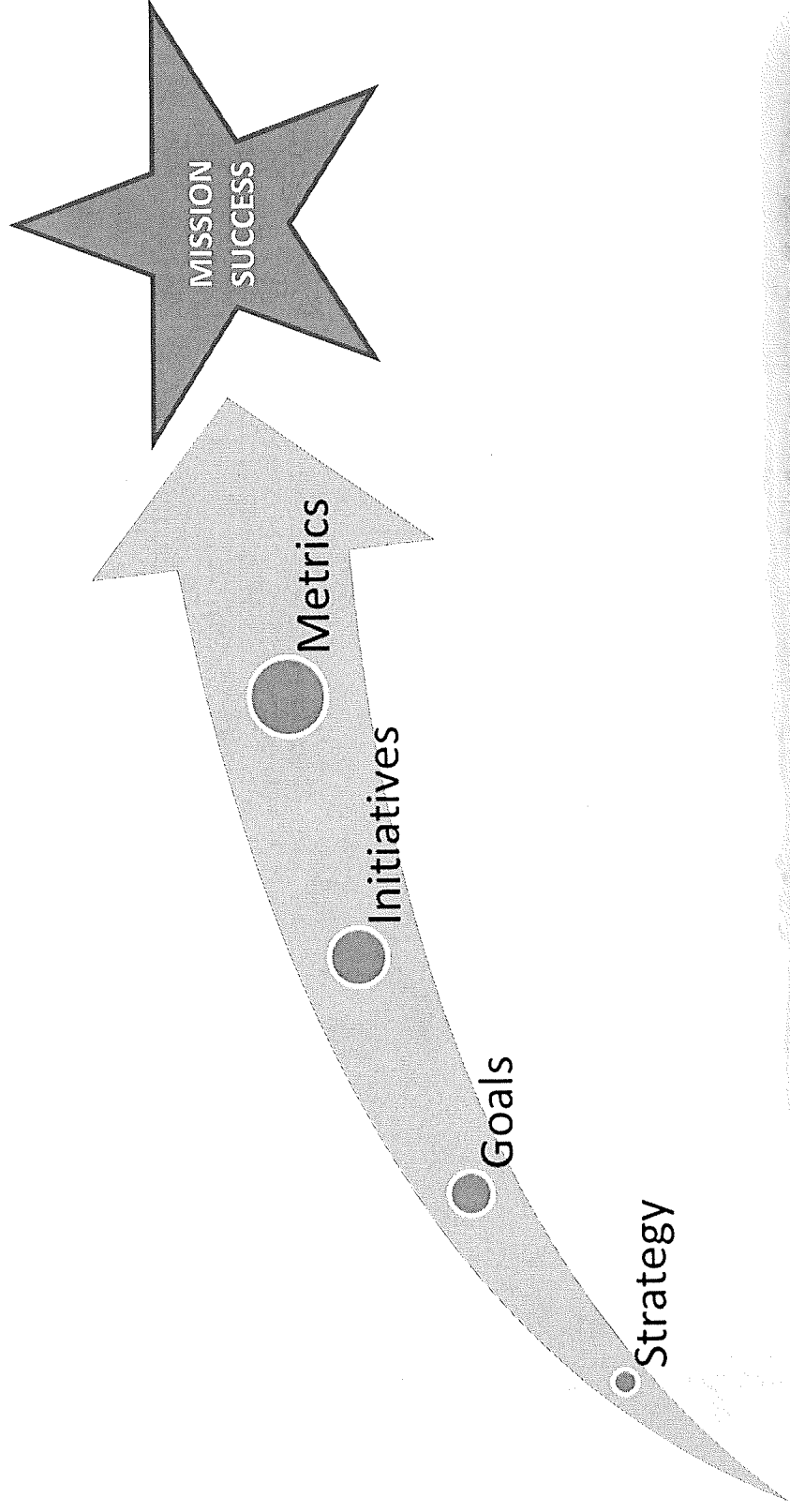
Empower the Kentucky Army National Guard to maintain sustainable forces and capabilities to protect the nation through global and domestic operations. KYARNG's broad goals in sustainability are to:

- **INSTITUTIONALIZE** sustainability as an organizing and management principle;
- **INCREASE** awareness, cooperation and support for sustainable practices;
- **INSTILL** a sustainability attitude in Soldiers and Civilians; and
- **IMPLEMENT** sustainable decision-making across ARNG.



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Energy Conservation Goals & Sustainability Strategy

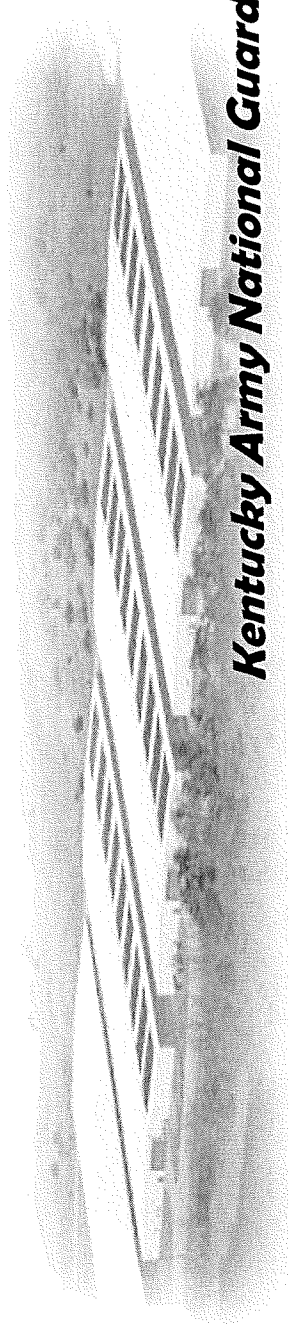


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Executive Order 13693

“Planning for Federal Sustainability in the Next Decade”

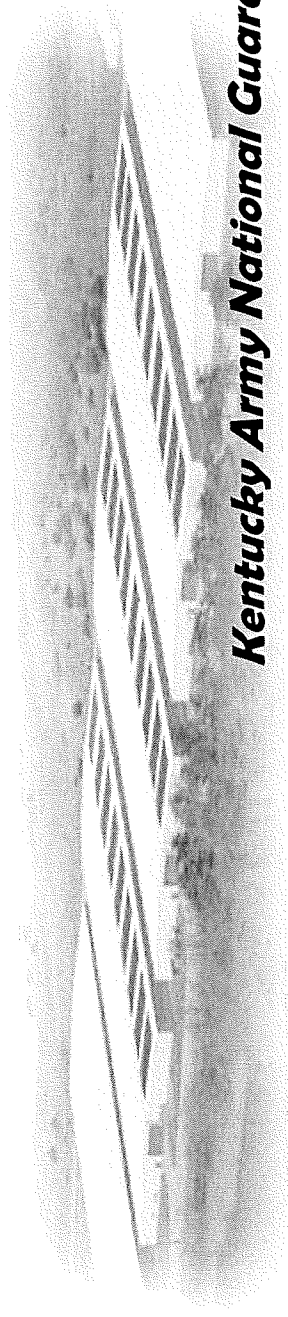
- **Energy Intensity** – 2.5% annual reduction to **FY2025** using FY2015 baseline
- **Building Electric/Thermal Energy** – Must be clean energy from renewable electric energy & alternative energy, beginning in **FY2016 at 10%** increasing to **30% by FY2025**
- **Potable Water** – 2% annual reduction to **FY2025; 36%** overall reduction by **FY2025** using FY2007 baseline
- **Net Zero Buildings** – Improve building efficiency, performance, and management



Kentucky Army National Guard

Energy Security & Sustainability (ES²) Strategy

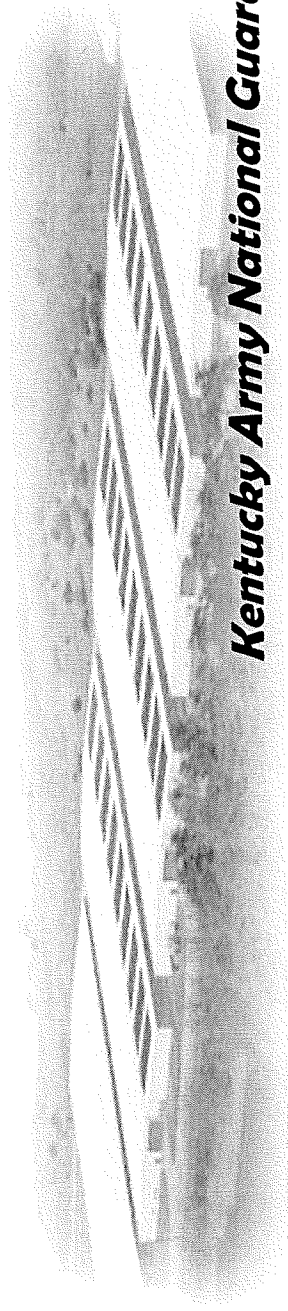
- Five ES² Strategic Goals
 - **Inform Decisions:** Incorporate sustainability in plans
 - **Optimize Use:** Minimize demand. Increase efficiency
 - **Assure Access:** Diversify and expand resources
 - **Improve Resiliency:** Foster adaptability
 - **Drive Innovation:** New ideas. Continuously improve



Kentucky Army National Guard

Integrating Sustainable Design

- Keeping energy efficiency in mind during design
 - Insulation & Durable Materials, Building Envelope
 - Building Orientation, Daylight Harvesting
 - Efficient HVAC & Ground Source Heat Pumps
 - Efficient lighting & controls
 - Cool Roof Systems
- High Performance Building Standards
 - 200 KAR 6:070, UFC 1-200-02, ANSI/ASHRAE/IESNA Standards
 - LEED Silver
- **NET ZERO**



Kentucky Army National Guard

Energy Audits & Commissioning

Where do you start??

- Retro-Commissioning of Existing Buildings
 - Preliminary Energy Use Analysis/Benchmarking
 - Investigation and functional testing
 - Identified improvements and opportunities
 - Prioritized energy efficiency efforts

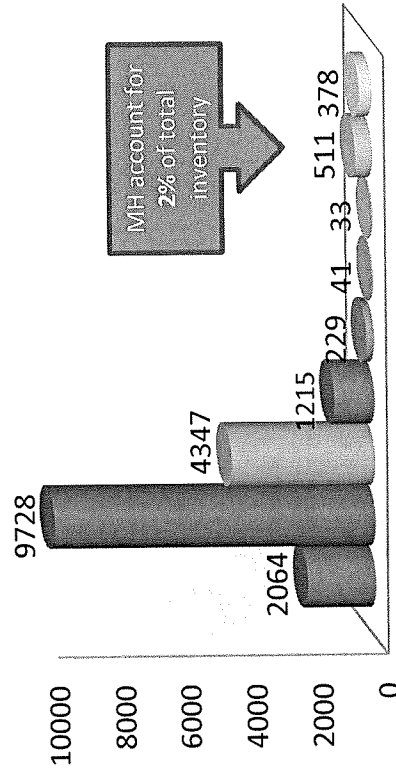


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Interior Lighting Survey

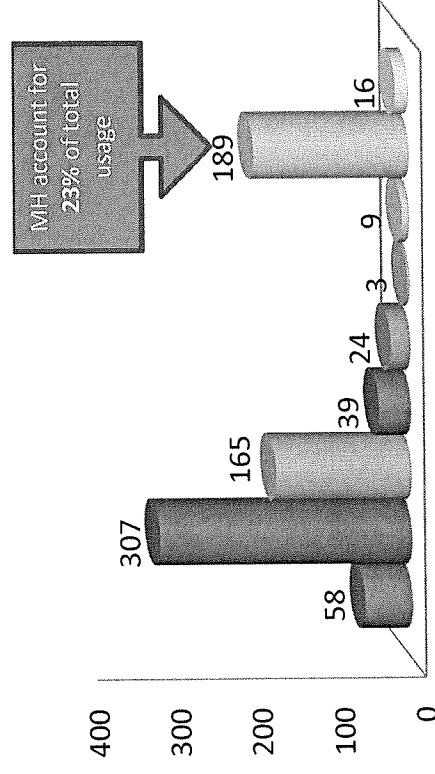
Completed December 2015

Total Lamps by Fixture Type

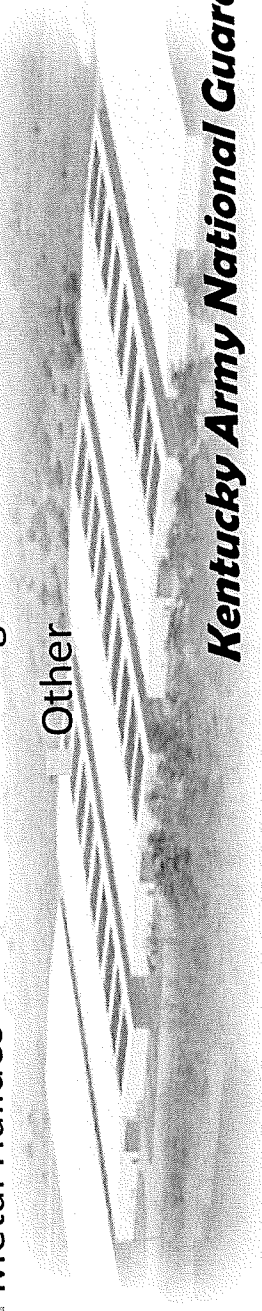


- T-5
- T-12
- LED
- Halogen
- Other
- T-8
- CFL
- INC
- Metal Halides

Total KW Usage by Fixture



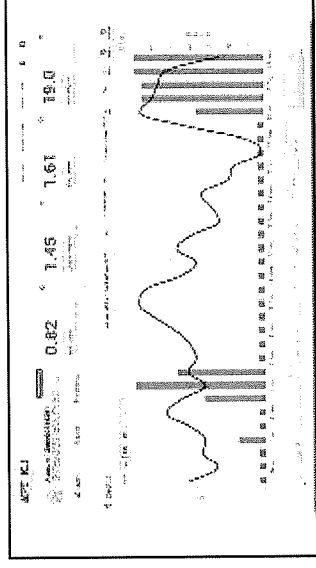
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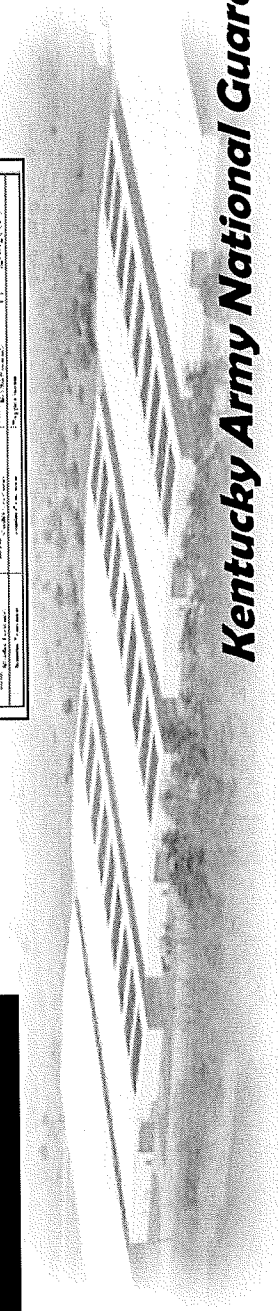
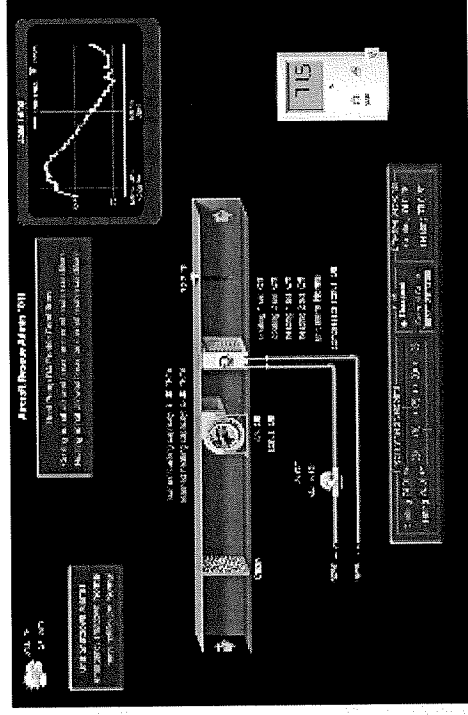
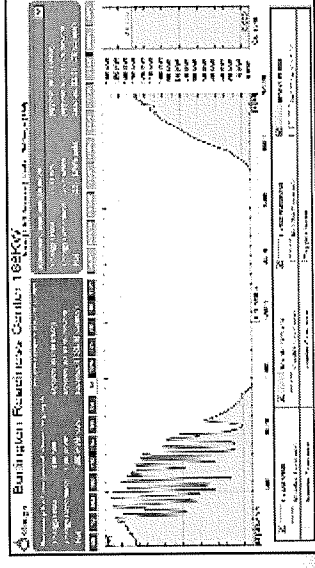
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Controls, Meters, & Monitoring

- Web-based building automation systems
 - Trending, scheduling, temperature set-points
- Advanced Meter Service

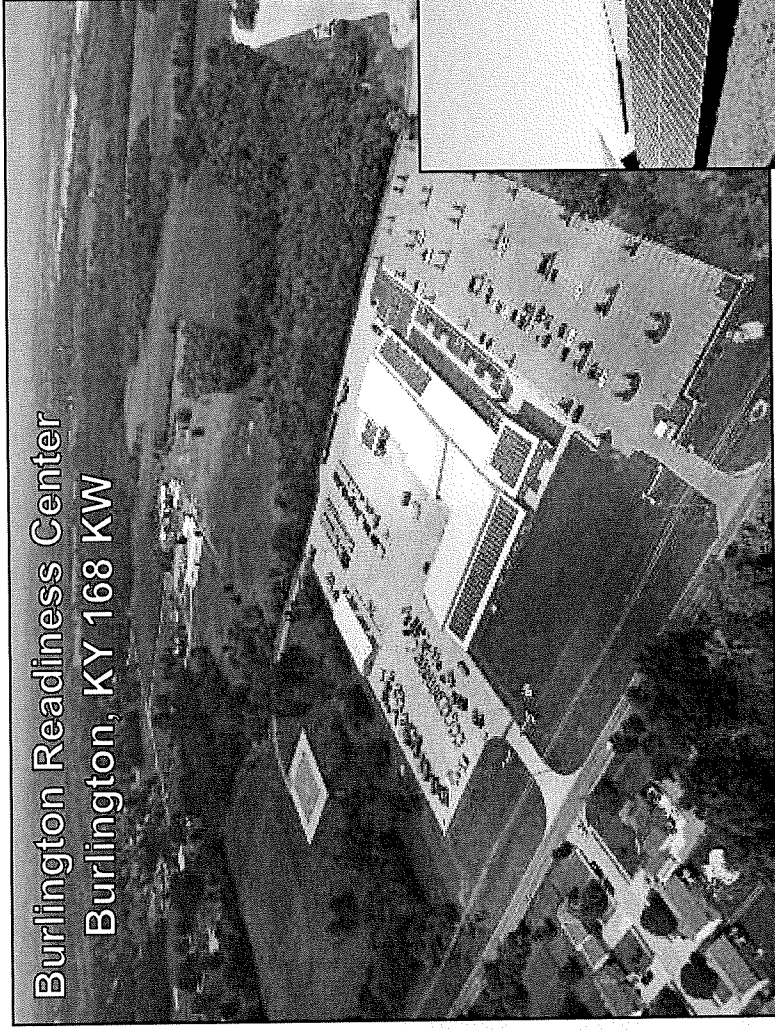


- eGauge Energy Monitor

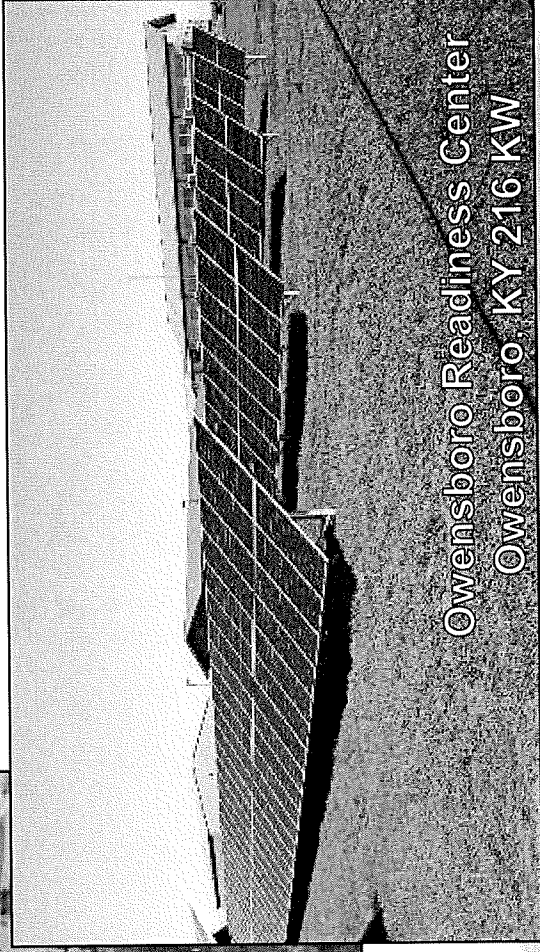


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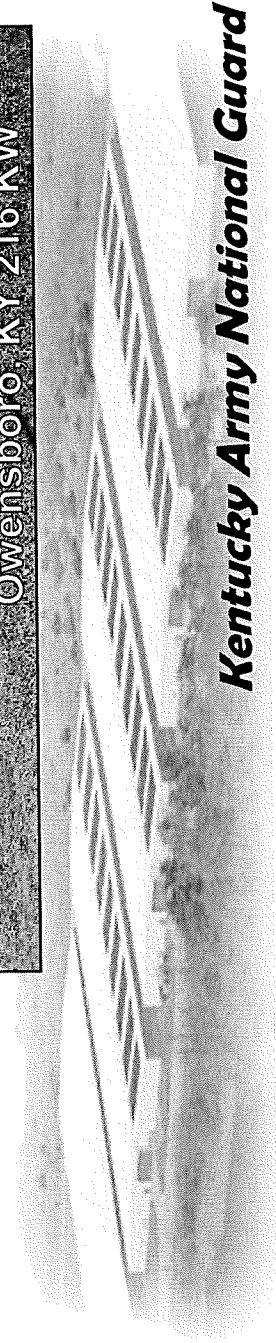
Renewable Energy



Burlington Readiness Center
Burlington, KY 168 KW



Owensboro Readiness Center
Owensboro, KY 216 KW



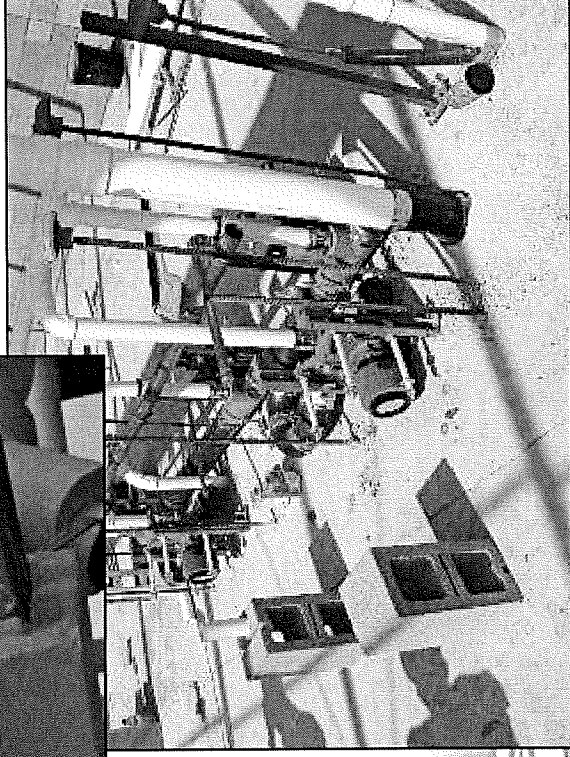
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Harnessing The Earth: Geothermal

- Facilities with GSHPs:
 - Richmond Armed Forces Reserve Readiness Center
 - Richmond Armory Expansion
 - Richmond Field Maintenance Shop
 - Morehead Readiness Center
 - Burlington Readiness Center
 - Harlan Armory
 - Army Aviation Support Facility
 - 108 wells at 400ft deep

• **\$0.24/SF/Year in savings***

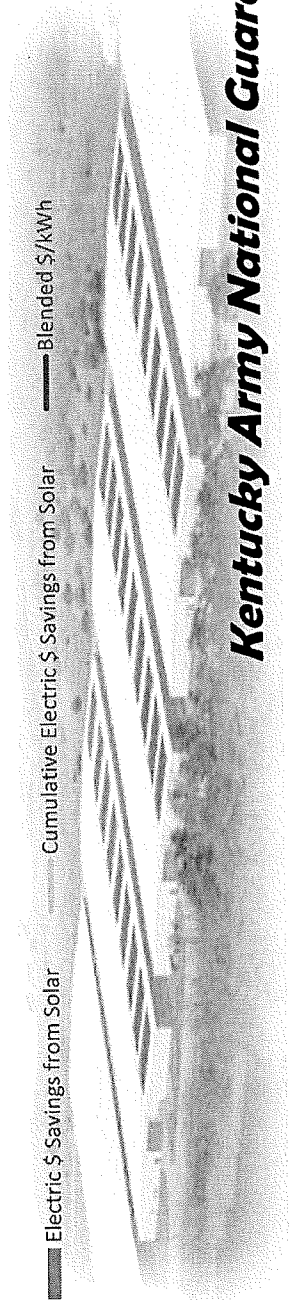
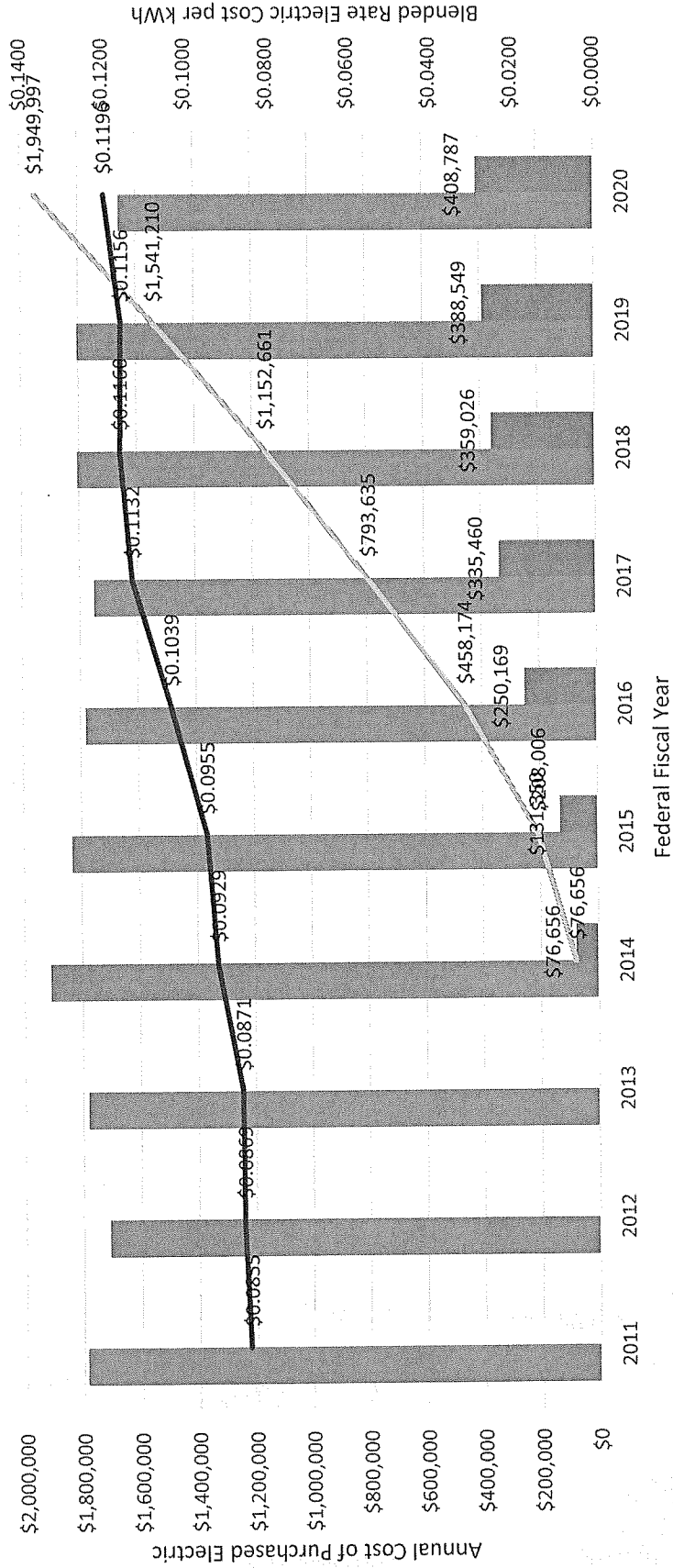
*based on simulation models using eQuest 3.65 energy analysis software.



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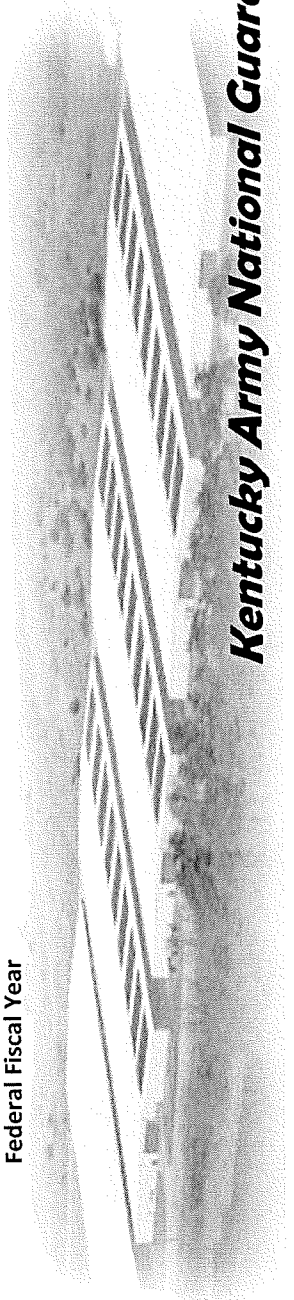
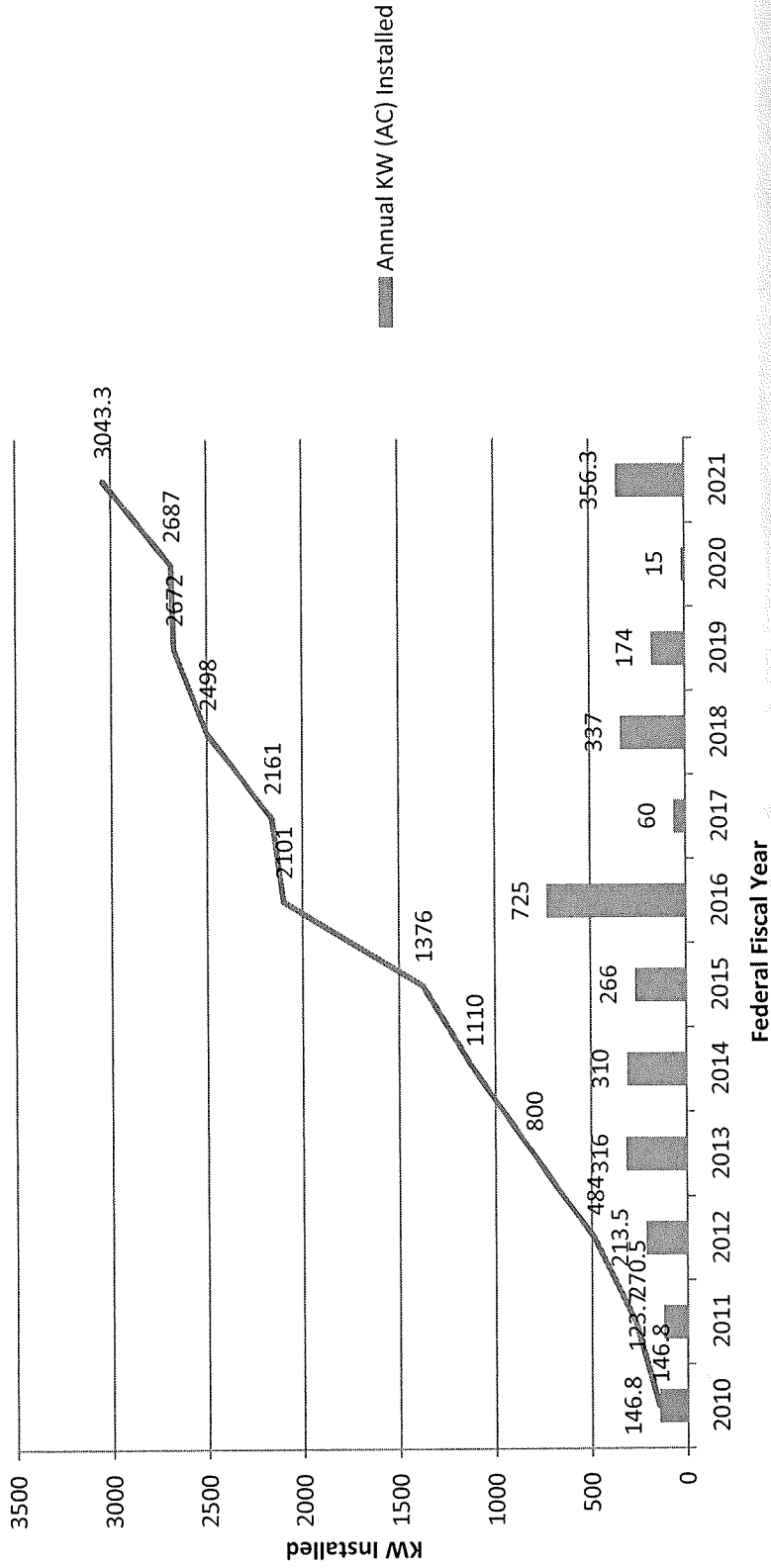
KYARNG Electric Cost Report



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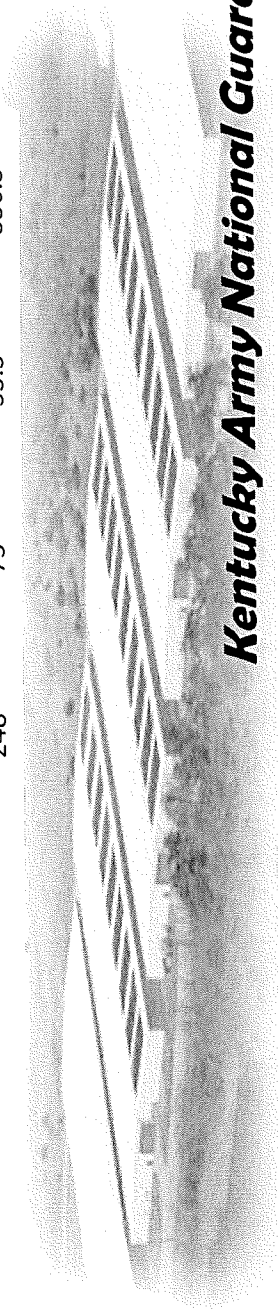
KYARNG Cumulative KW Photovoltaic Installed



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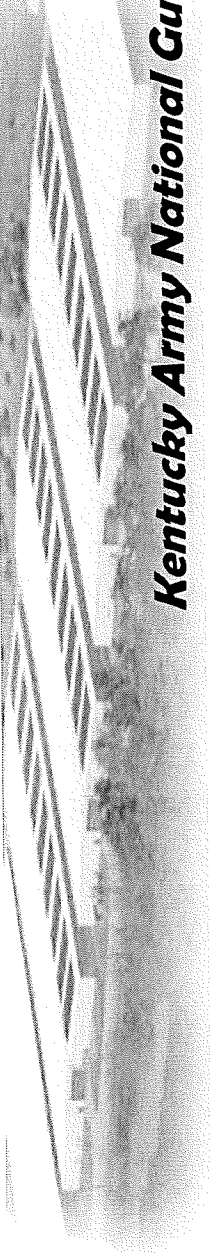
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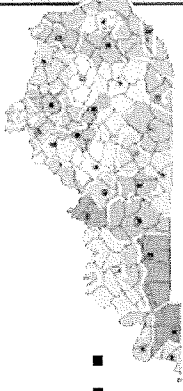
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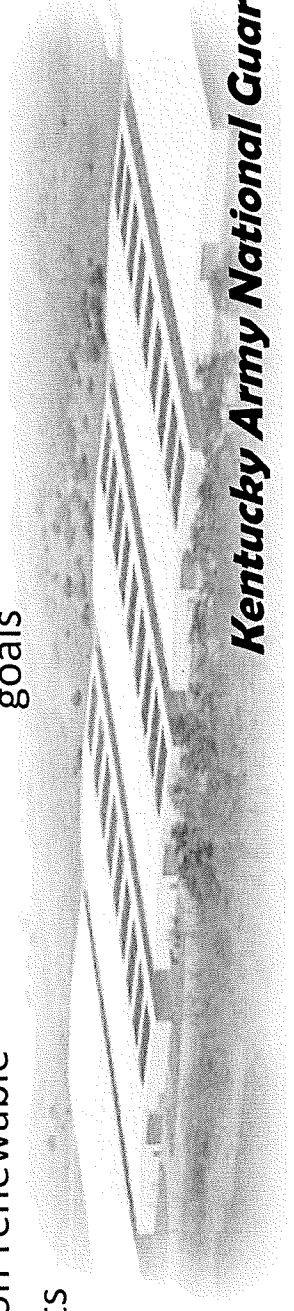


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KYARNG Way Ahead..



- **Change the Culture (Institutional/Behavior Change)**
 - Continue promoting KYARNG energy awareness programs
 - Sustainability needs to be integrated cross-functionally from every level order to be successful
- **Drive Efficiency Across KYARNG**
 - Complete no cost/low cost efforts
 - Energy efficiency projects before long term payoff renewable energy projects
- **Build Resilience through Renewable /Alternative Energy**
 - Promote alternative financing mechanisms
 - Focus on large scale projects
- **Energy Master Plan**
 - Holistic roadmap integrated into other installation plans and policies
 - Work constructively towards energy efficiency, renewable energy, and energy resilience goals

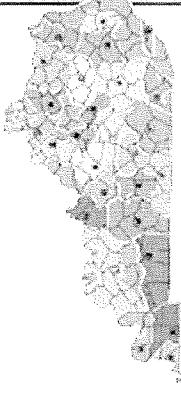
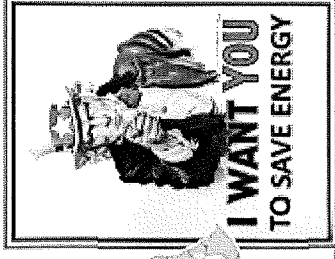


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KYARNG

Acknowledgements

- The Kentucky Excellence in Energy Leadership Award 2017
 - 41st Annual Governor's Conference on Energy & Environment
- NGB Metrics
 - KYARNG is currently the LEADER in owned photovoltaics
 - KYARNG TOP 5 in energy reduction



Installation	Total Owned Capacity (kW)	Project Count
KENTUCKY ARNG	3,005	35
NEW JERSEY ARNG	2,744	11
NEVADA ARNG	2,589	2
UTAH ARNG	2,380	5
ARIZONA ARNG	1,607	20
CALIFORNIA ARNG	1,279	3
OREGON ARNG	1,201	13
VIRGINIA ARNG	915	6
GEORGIA ARNG	598	11
ALABAMA ARNG	575	2
TEXAS ARNG	348	4
MONTANA ARNG	332	7
HAWAII ARNG	274	5
MICHIGAN ARNG	257	1
NEW HAMPSHIRE ARNG	252	4

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